

5STS-125 FLIGHT PLAN WALKTHROUGH (WITH RATIONALE)

The following day by day walkthrough of the mission timeline is outlined for the 11 day mission, as published in the Flight Plan.

Mission Overview:

- **Introduction:** STS-125 Hubble Space Telescope (HST) Servicing Mission-4 (SM-4) to repair and extend the life of the HST is an 11 day mission with 5 EVAs. Orbiter Atlantis (OV-104) will achieve a 305 n. mi. orbit and will rendezvous/grapple HST will occur on FD3 and release on FD9.
- **Crew:** Three (3) crewmembers have been selected from previous HST SM missions, and four (4) first time Shuttle flyers.
 - CDR - Scott (Scooter) Altman (HST Vet)
 - PLT - Gregory (Ray J) Johnson
 - MS1 - Mike (Bueno) Good
 - MS2 - Megan McArthur
 - MS3 - John Grunsfeld (HST Vet)
 - MS4 - Mike (Mass) Massimino (HST Vet)
 - MS5 – Drew Feustel
- **Daily Launch Window:** The Launch Window ranges from 62 to 66 minutes depending on the day. Due to predicted negative ascent performance at the opening of the window, it was decided to launch at 20 minutes into the window.
- **HST SM4 Objectives:** In priority order:
 - Replace two (2) gyros on each of three (3) Rate Sensor Units (RSU)
 - Replace the Wide Field and Planetary Camera 2 (WFPC2) with the Wide Field Camera 3 (WFC3)
 - R&R the Science Instrument Command & Data Handling (SI C&DH) module
 - Replace the Corrective Optics Space Telescope Axial Replacement (COSTAR) with the Cosmic Origins Spectrograph (COS)
 - R&R Battery Modules in Bays 2 and 3
 - Repair the Space Telescope Imaging Spectrograph (STIS) or
 - Repair the Advanced Camera for Surveys (ACS)
 - Replace Fine Guidance Sensor (FGS) with FGS2
 - Replace damaged thermal protection of Bay 8 with the New Outer Blanket Layer 8 (NOBL 8)
 - Replace damaged thermal protection of Bay 5 with NOBL 5
 - Replace damaged thermal protection of Bay 7 NOBL 7 (*currently not scheduled in the Flight Plan*)
 - Install the Soft Capture Mechanism (SCM)
 - Reboost the Hubble Space Telescope (*currently not in the Flight Plan*)

Contingency Mission Scenarios:

- **Slip Impacts in the Daily Window:** Each minute delay in the daily window results in one minute earlier rendezvous, grapple, release and landing times. However, NH does not always coincide with this pattern and the Flight Dynamics Officer (FDO) will provide the NH opportunities as soon as possible post OMS-2 to enable the FAO to develop new sleep cycles if necessary. Delays within the daily window can adversely impact the timeline depending on the day of launch, causing Shuttle Crew Scheduling Constraints (SCSC) violations.

- **Focused Inspection (FI):** If an FI is required, it is planned to occur on FD5 concurrently with EVA prep activities. Two RMS crew will perform the FI. 1 hr 30 minutes is available for inspection time before impacting the start of EVA2.
- **HST Deploy EVA Contingencies:** EV crew will be prepared to perform EVA 6; for example to manually release HST on FD9. Several failure scenarios could lead to this necessity. Prior to HST release, EV crew will perform EVA prep through LVCG donning. A day will be added to the mission, moving Late Inspection (LI) surveys to FD10 and Off Duty moving to FD11. Ref Flight Rule 125_A15-1 UNSCHEDULED/CONTINGENCY EVA FOR HST SUPPORT and 125_A2-37 MISSION EXTENSION DAY IMPACTS IF SIXTH EVA PERFORMED FOR HST.
- **STS-400:** In the event the orbiter is damaged and not usable for reentry STS-400 will be called and can launch as early as 7 days after launch.

HST/SSE Information:

- **HST SSE:** The Space Support Equipment (SSE) is the entire complement of HST support equipment which includes the Flight Support System (FSS) to which HST is berthed, payload bay carriers with fixed instrument stowage locations, a Bit Sync Adapter (BSA), and the Relative Navigation Sensors (RNS).
 - FSS is a maneuverable platform for HST with electrical power control and monitoring interfaces between HST and the Orbiter. It also consists of a Berthing and Position System (BAPS) post for loads support and HST SM avionics.
 - The BSA is a device used to support commanding and downlink of telemetry through the PDI and S-band comm. system
 - The RNS is an imaging system consisting of optical and navigation sensors. It performs imaging and data collection during capture and deploy to support future rendezvous and docking navigation operations. Data is downlinked (RNS dumps) at various times throughout the flight.
 - The payload bay carriers include:
 - Super Lightweight Interchangeable Carrier (SLIC)
 - Orbital Replacement Unit Carrier (ORUC)
 - Multi-Use Lightweight Equipment (MULE)
- **Berthed HST Rotations/SA Slews/Pivots:**
 - Rotations: On the FSS, the HST can rotate to different orientations (e.i. -V2 forward, +V3 forward) to ease crew & RMS access to the EVA work areas, as well as provide clear views for still photo and video surveys
 - Solar Array Slews: HST solar arrays can be re-positioned (slewed) to various angles. 0 deg. is defined as active side of solar arrays facing down, parallel to the Orbiter Y-axis. 90 deg. is perpendicular with active side facing aft.
 - Pivot: The FSS can also pivot. In order to berth HST, the FSS is pivoted 90 deg from its launch position.

Generic Timeline Items & Constraints

- **Exercise Constraints:** None
- **Attitudes and Maneuvers Overview:** The HST is in a high debris field and since there is no ISS safe haven on this flight, attitudes are optimized for MMOD, except where necessary for HST thermal, battery charging and instrument protection requirements. -ZLV, -XVV will be the standard attitude. Maneuvers are also designed with prop conserving DAPs where possible, since the orbiter is tight on prop for this mission and high altitude.

- During EVAs, a series of maneuvers will be executed to protect the opened Aft Shroud Door (ASD) and payload bay transport volumes (meaning, the instruments stowage location and transport paths to HST) from the sun. This sun protect applies to most, but not all HST EVA tasks. Before sunrise on every orbit, the orbiter maneuvers to an LVLH attitude that resembles Tail-to-Earth. Then at about orbital noon, the orbiter snaps to an inertial hold (to keep the area shielded) until the sun sets, at which point it maneuvers back to the LVLH attitude and does it all over again, until no longer need during the EVA.
 - Sunrise Protect = LVLH
 - Sunset Protect = Inertial
- The sun protect maneuvers are considered critical, so all EVAs will have G2 Expansions (Dual G2) for the duration of the EVAs.
- Bias –XSI, HST Battery Charging attitude. Battery charging requires one ~60 min. daylight pass. The standard attitude is 29 deg above the orbiter –X axis. Per Flight Rule 19-67, this attitude can be varied in a range between 29 and 0 degrees, as long as it maintains 29 degrees between the solar vector and the solar array (SA) panel normal of the active side of the arrays. The amount of bias permitted has to be in sync with the degree of SA slew.
- **Orbiter Inspections:** Performed on FD1, FD2 and FD9. If Focused Inspection is required, it will be scheduled prior to the start of EVA 2 on FD5.
 - **FD1:** RMS EE Crew Cabin Survey
 - **FD2:** WLE RCC, Belly Tile, ET Door, T-0 Umbilical, OMS Pod-RMS & Still photo
 - **FD5:** Focused Inspection (if required) – Not timelined pre-mission
 - **FD9:** Late Inspection WLE RCC surveys. Includes daylight requirements for IDC
- **EVA:** Five (5) back to back EVAs performed out of an external orbiter airlock are planned in the 11 day mission to perform the HST SM4 objectives.
 - Four (4) EVA crewmen organized in two EVA Teams.
 - Two IV crewmembers per EVA, each responsible for a specific EVA task rather an entire EVA.
 - Two RMS EVA support, CDR & MS2.
 - The EVA's are all 6.5 hrs or less in duration.
 - On FD02, the Orbiter cabin will be depressed to 10.2 psi and will remain there until FD9 (post HST Release). This allow for the five back to back 6.5 hour EVAs to fit in the timeline, by reducing the Prebreathe + Purge duration to 40 + 8 minutes.
 - HST Solar Arrays must be positioned at 0 deg for EVAs
 - The axial orientation of HST during the EVAs varies per EVA task
- **PDRS:** The RMS supports orbiter inspections, HST surveys, and HST EVA tasks
 - The RMS is left powered from FD01 until the day after HST Release and Late Inspection on FD9
 - Manipulator Control Interface Unit (MCIU) filter screen checks are scheduled daily prior to RMS Ops, except on days when standard Filter Check is scheduled.
- **EECOM:**
 - 10.2 Depress/14.7 Repress - 10.2psi Cabin depressurization occurs on FD2 (pre HST RNDZ) to support the 5 back to back EVAs. 14.7 psi Repress occurs on FD9 (post HST Release) when it is certain that no further EVAs are required to HST deploy contingencies.
 - 10.2 MAINT - 10.2 Maintenance compensates for normal cabin pressure decay by flowing N2 and/or O2 into cabin in order to maintain approximate 10.2 psi atmosphere.

- One 10.2psi maintenance will be performed FD2, prior to Sleep. Three (3) are required daily for subsequent days. On EVA days, the first occurs prior to EMU Purge, the second post EVA Ingress/repress, the last just before Sleep. These times have been determined by past HST flight experience.
 - Do not perform during EMU purge or EMU Checkouts (will cause confusion on the suit data signatures and will result in the EMUs requiring a power cycle.)
- Water Dumps: Nominally scheduled as all simo FD3, FD5, FD7, FD9
 - Constraints: Dumps must be terminated 2 hours prior to opening of HST aft shroud door during EVAs, for contamination concerns
 - If Focused Inspection required, the FD5 simo dump will move to FD4 morning. The simo dumps for the remainder of the mission would probably be scheduled on FD6, FD7 and FD10
 - Note, if an alternate launch date or a long launch delay in the daily window forces the NH burn to occur early, the supply portion of the simo dump will be reduced. A FES dump will be required of a duration of 6 minutes for each minute of supply dump reduction.
- FES Dumps: FD2, FD4 thru FD6. FD8, FD9, FD11
 - PRI B til FD9, then after Nominal H2O Config, PRI-A
 - Constraints: FES Init and Term cannot be scheduled while crew connected to the SCU. This would result in a 57 degree temperature transient to run the suits.
 - No HST contamination constraints
- Hum Sep Ck – The humidity separators are checked in PSA on FD2 & FD6
- **EPS:** Group B Powerdowns/Powerups performed as required
- **DPS:**
 - G2 Set expansion (Dual G2) is scheduled prior to critical HST aft shroud door (ASD) orbiter sun protect maneuvers
 - NC1 is a critical burn due to a tight FD1 timeline and therefore requires Dual G2
- **GNC**
 - IMU star of opportunity aligns are scheduled daily, when possible
 - IMU align and verif on entry day (FD12)
- **MMACS/Crew Systems:**
 - OCAC Filter Inspection: Scheduled as an EZ Activity each day, unless Filter Cleaning is performed
- **PMCs:** Private Medical Conferences are generally scheduled in Presleep and performed via A/G. On F8, the PMC is scheduled via OCA to ensure Netmeeting software operation prior to Private Family Conferences (PFC's) on FD09.
- **PAO Events:**
 - There are four specific PAO events in the mission
 - FD10 will have a Crew Conference and the ISS ship to ship call.
 - FD11 will have one with select media networks and one with a VIP.
 - All events will be in High Definition (HDTV).
- **Crew Choice Downlinks:**
 - Performed in HDTV, everyday except FD2, FD3, FD9.
 - The crew will playback 5-10 minutes of the day's highlights.
 - Constraints: No TDRS-Z, No OCA iHigh Rate (48Mbps)
- **HDTV Event Summary:**
 - FD1 HDTV test during the ET Video downlink

- Crew choice downlinks, scheduled every day except FD2,FD3, FD9
- PAO Events (4)
- HST Grapple and Berth playback (FD3)
- HST Release playback (not currently scheduled on FD9 due to lack of time)
- **Photo/TV:** Photo/TV operations are intensive and complex for this flight with interest in HST grapple/release, surveying the HST for damage, FSS and HST mechanism operations, EVA tasks, etc.
 - P/TV01: Video Setup (General)
 - P/TV02: SSE Survey
 - P/TV03: FSS Ops
 - P/TV04: HST Retrieve/Berth
 - P/TV05: HST Survey
 - P/TV06: HST EVA
 - P/TV07: HST Reboost
 - P/TV08: HST Release
 - P/TV09: ICBC3D
 - P/TV10: External Survey
- **PGSC**
 - PGSCs will be rebooted daily except for STS6 (RPOP2) and STS7 (WLES) as noted in the EZ blocks.
 - A 760 will be used as a MFX backup and a deep backup for ICBC-3D.
 - Nominally STS6 (RPOP2) will be the primary machine used for ICBC-3D operations.
 - OCA Router STS-1 (and the MUX) will be configured for 48Mb/sec rate on FD2 thru FD10.
- **OCA 48Mbps Downlink and SWRDFSH:**
 - STS-119 was first flight of SWRDFSH, the file transfer application to eventually replace the KFX software.
 - SWRDFSH allows OCA to downlink at the higher 48Mbps rate vs 2Mbps rate limited by the KFX software. There's no crew interface with SWRDFSH and should be no impact.
 - In order to take advantage of the 48Mbps downlink, the crew reconfigures the OCA downlink rate (published procedure in ORB OPS C/L).
 - High-speed downlink operations (48Mbps) will occur on PAYLOAD (PL) MAX channel 3. Crew will set the DTV MUX switch to "BYPFR" and set it back to "ACT" when the crew deconfigures OCA downlink rate. Note: Using PL MAX for OCA prevents DTV and HDTV downlinks.
 - PL MAX is scheduled most of the flight, with the highest priority on FN2 and FN9 to bring down inspection imagery.
- **Secondary Payloads/SDBI's:**
 - IMAX Cargo Bay Camera-3D (ICBC-3D):
 - It consists of the camera with a turret of lenses containing a 30mm wide-angle lens, 40mm and 60mm, and a film magazine containing approximately 5400 ft of film (8 min).
 - ICBC is mounted on the ORUC in the payload bay. The primary PL bus (Payload Aft B) supplies power to ICBC3D through the PL Accommodation Terminal (PAT) box in the PL bay.
 - The crew operates ICBC3D using a Payload and General Support Computer (PGSC) that plugs into the Payload Data Interface Panel

- (PDIP). The PGSC enables the crew to operate the camera, monitor camera status, and verify command status.
 - In addition to external scenes using the cargo bay camera, the ICBC Canon G-1 HD camcorder will be used for internal scenes.
 - An audio recorder provides the opportunity for crew narration or dialog
 - Daily tagups are requested to know which scenes were accomplished during the day to assist in replanning.
 - ICBC will be activated on FD1 and deactivated on FD12
- NLP (National Lab Pathfinder) Investigations
 - The purpose of this payload is to investigate the effect of spaceflight on microbial gene expression, virulence, and drug resistance. The data will be used to decrease infectious disease risk to the crew and could be used to create new approaches to vaccines used on earth.
 - NLP is an unpowered payload, flown in a single Middeck locker.
 - NLP includes 14 Group Activation Packs (GAP) that are stowed at ambient temperature and one hand crank.
 - The crew activates GAP on FD2 and terminates 48 +/- 2 hrs later
- SDBIs 1634 (Sleep Short)
 - Subjects wear Actiwatch activity monitors (watches) throughout the mission.
 - Participants: CDR, PLT, MS2, MS4, MS5
 - FD1- Don Actiwatch
 - FD2- FD12 Sleep Log Book on all participants on a best effort basis
 - FD12 -Stow watches
- MAUI (Payload of Opportunity)
 - The MAUI payload involves dedicated Orbital Maneuvering System (OMS), Primary Reaction Control System (PRCS) and Vernier Reaction Control System (VRCS) thruster firings. Will be scheduled if overflight opportunity and timeline permit.
- SEITE (Payload of Opportunity)
 - Investigates plasma turbulence driven by rocket exhaust in the ionosphere. SEITE satellite instrumentation will pass through the far field plume from Space Shuttle Orbital Maneuvering System (OMS) engines. Instruments that measure electric fields, plasma waves, plasma densities, and magnetic fields will detect plasma turbulence produced by the OMS engine exhaust.
 - Requirements include
 - The timeline/State Vector (SV) for a dedicated thruster firing
 - Be within 162 n.mi. (300 km) distance of a SEITE satellite.
 - Video and/or still camera imagery of the OMS burn is desired.

Flight Day 1 - Launch, Post Insertion, SSE Activation, Crew Cabin Survey

FD1 Overview: FD1 is a 7 hour crew work day, post launch. Following Post Insertion (PI), the crew continues to prepare for orbit ops with orbiter and crew system setups, RMS Checkout (C/O), NC-1, RMS End Effector (EE) Crew Cabin Survey, and HST prep activities.

OMS/RCS Burns: NC-1 is currently planned to be -X RCS. It is a critical burn due to the tight and constraining timeline on FD1 which includes SSE Checkout and RMS EE Crew Cabin Survey.

Attitudes/Maneuvers: The payload bay door opening (PLBD) attitude is –ZLV – XVV. Following the NC1 burn, the orbiter will be maneuvered back to –ZLV – XVV. This will be the attitude for the remainder of the day and until the NC-2 burn on FD2.

FD1 Free Drift periods:

- RMS Powerup
- RMS Checkout

DAP Notes: The maneuver to and from the NC-1 burn is scheduled to be performed on the A7 DAP for prop conservation. A faster rate is acceptable if required in real-time.

Orbiter & Crew Systems:

- Standard Scheduled: Following Post Insertion, the following standard FD1 orbiter and crew system activities are scheduled.
 - Aft Controller Checkout
 - Elevon Park
 - Galley Iodine Removal Assembly (GIRA) Install
 - Shuttle Emergency Eyewash (SEE) Setup – must occur after GIRA is installed since Emergency eyewash bottles are filled using galley water
 - APU Reconfigs
 - Tissue Equivalent Proportional Counter (TEPC) – Power On
 - Group B Powerdown – Post NC-1, returns to Single G2
 - Hum Sep check is not required in Presleep
 - Insert Bleed Orifice assembly into LEH O2 8 QD
 - CDR and PLT seat power deactivation
 - Not in the Final Rev A Flight Plan. Will be added as an Errata item.
 - Prior to STS-119, smoke generated from the PLT seat in the Bldg 9 trainer was determined to be a short in the seat adjustment motor brake. It was decided to power off the CDR/PLT seats on FD1 and re-power on Entry day
 - IMU Star of Opportunity Align
- EZ Activities:
 - PCS 1 (2) Config
 - Smoke Detection Circuit Test and
 - Lamp Test
 - CSA-CP Battery Changeout and Checkout
 - The alkaline battery has limited life and therefore is required to be replaced on FD1. The device is then checked out and calibrated.
 - D2Xs EVA Camera date/time setup
 - VTR Clock setup
 - Foot Restraint Equipment Device (FRED) Install – to assist the crew when performing RMS operations
 - OCAC Filter inspection
 - OCAC is set up in Post insertion

RMS Ops:

- RMS activities begin with the On-Orbit Init, followed by RMS Powerup, and RMS Checkout.

- The RMS Payload Bay Survey (PLB) is an optional crew activity for practice using the arm. For this flight, the FSS Umbilical Survey will be performed at this time.
- RMS End Effector (EE) Crew Cabin Survey is then performed since no time exists on FD2. The RMS is parked in pre-cradle overnight and is not powered down.

Crew Cabin Survey: The RMS EE Crew Cabin survey is a requirement specific to this flight since there will be no ISS RPM imagery. This survey begins 10 minutes after the SRMS is in position and requires daylight and real time Ku. Portions of the survey not captured in real time, must be played back by the crew prior to FD3. The survey should not be performed during NC-1. The procedure configures the DAP to A14.

Ascent Imagery: ET handheld photos and ET umbilical well photos will be downloaded to a PGSC (most likely KFX machine, STS-3) for OCA downlink. The umbilical well photos are downloaded twice per the procedure. ET Video will be downlinked via Ku and will also serve as a test of the HDTV system.

HST Systems: When orbiter power is applied (in Post Insertion) via the primary payload bus from Panel R1, the SSE will begin to receive power. SSE loads are controlled thereafter from the standard switch panel on the aft flight deck. SSE heaters will be activated within 22.2 hours after PLBD opening.

- SSE Activation - Enables MDMs to the FSS and MULE. Enables heaters to the FSS, ORUC, MULE and SLIC. Activates the RNS.
- BSA Instl & Config – Unstow, Setup, apply power and configure
- SSE Checkout – Checkout of FSS and MULE. Can be performed anytime prior to rendezvous; however, timeline constraints requires it to be performed on FD1. There are still Photo/TV (P/TV02) requirements in addition to visual inspection.
 - FSS Umbilical Survey (PDRS C/L) will be performed during the RMS Payload Bay Survey.
 - The P/TV02 video requirements will be met overnight using the payload bay and RMS elbow camera, with the RMS in pre-cradle).

Photo/TV:

- P/TV01 Video Setup – Standard FD1 Photo/TV setup for the mission. Additional time is provided on FD2. The first few steps are required prior to playing back the ET video. Steps 1-7 are the minimum required for FD2 OBSS TPS inspection.
- P/TV02 SSE Survey - Scheduled during the SSE Checkout. Still and video survey of SSE carriers after on-orbit arrival. Also uses PL bay cameras for overall imagery. RMS elbow camera surveys overnight while in pre-cradle.

PGSC: The entire network is scheduled to be setup on FD1

- PGSC setup - includes running the late update disk on the absolute minimum config of the Router, KFX, and WLES PGSCs. The wireless Access point and color printer are also required as part of the FD01 setup. Two crewmembers are scheduled to perform PGSC LAN setup.
- WLES ACT- Ascent summary data retrieval from the wings takes about 4 hours and cannot begin until WLES Activation is completed. OCA connectivity to the ground is not required at the completion of WLES Activation, but it needs to be available by crew sleep or 3.5 hours after WLES Activation is completed, whichever comes first. WLES Activation enables access to WLES data for assessment of ascent debris impact indications.

- UMB WELL D/L- Crew connects A31P to panel A13 and initiates software to downlink ET umbilical well camera images taken automatically during ET sep. Expect ~30 photos.

Secondary Payloads:

- ICBC-3D - activated no later than PLBD open plus 18 hours. The power on switch enables heaters within the ICBC-3D.
- The RPOP2 (STS6) PGSC is used for ICBC operations and is setup as part of PGSC Setup
- SDBI 1634 (Sleep Short) - Actiwatches are donned before sleep by CDR, PLT, MS2, MS4 and MS5.

Flight Day 2 – Surveys, FSS Prep, EVA Prep, RNDZ Prep

Overview: Setup for Rendezvous continues with NC2 and NC3 burns. Practically the entire day involves Orbiter inspection, which for STS-125 adds SRMS/OBSS survey of belly tile, ET door, and T-0 umbilical area to the standard WLE RCC. EV crewmembers prepare suits and tools. Orbiter and crew system on-orbit setups continue. The FSS is prepared for HST berthing.

OMS/RCS Burns: NC-2 and NC-3 are currently planned to be –X RCS. Neither are critical burns. NPC is not scheduled since it will be combined with one of the other two burns this day.

Attitudes/Maneuvers: Following the NC2 burn, Orbiter will be in –ZLV –XVV until the OBSS inspections are ready to begin with the Starboard WLE survey. Each of the Starboard, Port WLE and Nose Cap RCC surveys are performed in BIAS +XSI attitudes optimized for Ku. See “Surveys” section for more details on inspection attitudes. Upon completion of the surveys, the Orbiter maneuvers to –ZLV –XVV and remains there until the –X RCS NC-3 burn. Post NC-3, the Orbiter returns to –ZLV –XVV for the night. The maneuver for the FD3 morning Simo Dump is future loaded to kick off prior to crew wake up.

Free Drift periods:

- OBSS Unberth
- OBSS Berth

DAP Notes: The maneuver to the NC-2 and NC-3 burns are scheduled to be performed on the A7 DAP, for prop conservation.

Orbiter & Crew Systems:

- Crew Systems:
 - Ergometer Setup - Scheduled early in the mission prior to the first exercise session. For STS-125, the ergometer is setup in the middeck.
 - Filter Cleaning - Can be scheduled during Exercise since the crew is exercising on the flight deck. Filter cleaning prevents avionics damage which could result from overheating.
- PROP: OMS Pod Heater Reconfig scheduled post NC-2

- This activity turns on the B pod heaters in order to check out that string of heaters before docking. Return to A heaters morning of rendezvous
- GNC: IMU Star of Opportunity Align
- EECOM:
 - 10.2 Cabin Depr - The orbiter is depressurized to 10.2 PSI and will remain at 10.2 until after all scheduled EVAs are complete and after it is certain that an unscheduled EVA 6 is not needed to deploy HST.
 - FES INIT - Supply water dump using FES, using PRI B
 - 10.2 MAINT prior to crew sleep
 - For FD2, cannot be scheduled during EMU Checkout it will cause confusion on the suit data signatures and will result in the EMUs requiring a power cycle
- EPS:
 - Manual FC PURGE- Should be scheduled about MET 1/00:00. This capability is demonstrated once early per flight for Shuttle Turnaround Enhancement project (STEPS).
 - Fuel Cell Monitoring (FC MON) - Verifies end-to-end operations of FCMS Scheduled within first 48 hours of mission to have baseline data on the FC should any problems occur. OCA Downlink of file required after test completion.
 - Constraints:
 - Should not be scheduled during RMS operations. The FCMS ops and RSAD programs use different data streams. RSAD supports RMS operations. So if FCMS is run when RSAD is running some of the RMS data will be lost.
 - Should not be scheduled during RNDZ RPOP operations (including RNDZ Tools C/O). FC Monitor and RPOP both run on the WINDECOM PGSC but use different cables to hook into the PCMMU (therefore they cannot run simo).
 - CRYO O2 TK HTR SNSR CK – Must be scheduled on FD2. Cannot be done simo with 10.2 Depress. Verifies that over current protection for the Cryo O2 Tank D heaters is functioning properly.
- MMACS:
 - Water Spray Boiler (WSB) Controller Swap - Scheduled at appropriately 001/00:00 MET. Swaps from the WSB A to B CNTLR/HTR

PDRS/RMS Ops: Following NC-2, the SRMS grapples and unberths the OBSS for use during the TPS surveys. The OBSS is berthed upon completion of the surveys. The RMS returns to pre-cradle for overnight. Note, there is generally no constraint to performing OBSS Unberth simultaneously with FSS Prep, except for a crowded aft flight deck. Therefore, these activities are de-conflicted.

FD2 TPS Surveys (Overview):

- Due to unavailability of ISS RPM imagery, additional areas of the orbiter are required for inspection. The RMS EE Crew Cabin Survey is scheduled on FD1 due to lack of time on FD2. All FD2 inspection data should be on the ground prior to crew sleep. There are ~ 2 hrs 40 minutes of additional inspection time on FD2 compared to an ISS flight and makes for a very busy and tight timeline. The entire set of inspections on FD2 include:
 - Starboard and Port WLE and Nose Cap RCC using LDRI and best effort IDC

- OMS pod imagery (new for STS-125) is incorporated into nominal procedure pause points
 - T-0 Umbilical Area Inspection (new for STS-125) is incorporated into nominal procedure pause points during the STBD and Port RCC surveys.
 - If no concerns with ascent imagery, this may be deleted
- Belly tile survey using ITVC and best effort IDC
 - Scans entire Orbiter belly (new for STS-125)
 - Includes ET door/stripe survey (new for STS-125)
 - These scans occur at pause points during the Starboard and Port WLE procedures
- OMS Pod tiles using a handheld camera to take pictures from the aft flight deck windows
 - Scheduled in daylight

FD2 TPS Surveys (Additional Info):

- All RCC is inspected during the OBSS Starboard Wing, Nose Cap, and Port Wing surveys, in that order. The two wing surveys also cover most of areas of the crew cabin. Those crew cabin areas not surveyed would be captured during the RPM maneuver on ISS flights. Since that capability does not exist, the RMS EE Crew Cabin survey is required (see FD1).
- The OBSS survey procedures incorporate the use of supplemental ISIS Digital Camera (IDC) images during LDRI scans, thus reducing the likelihood of needing Focused Inspection. The IDC image is already available if LDRI indicates a suspect area.
- The OBSS Unberth procedure incorporates the LDRI 3D calibration.
- The Starboard survey incorporates the Flat Field calibration.
- Three crewmembers are required continuously during the surveys, two for SRMS/OBSS ops and one to operate situational awareness cameras and sensors. Only two crewmembers are required during unberthing and berthing operations (non-laser ops).
- The surveys are scheduled to continue through the night passes, but the crew may elect to pause if the night time visuals are not sufficient.
- The LDRI survey attitude requires no sun within a +/-15° field of view (FOV) of the laser bore-sight. Additionally, no sun can be within a 10° half-cone directly behind the instrument; however it is highly desired to keep the sun at a 90° half cone behind the instrument as long as it's not directly behind.
- The IDC requires no sun within a 10° half cone of the FOV and any infringement will result in the IDC instrument being powered off during those times. Informing the crew when to power off IDC will be taken care of in the PDRS procedures. The IDC line-of-sight is calibrated to align with the LDRI line-of-sight during scans.
- Real-time Ku is desired (not required) during the LDRI 3D calibration in OBSS unberth. Each surface scan requires as much real-time Ku as possible to downlink DTV using TDRS E or W (not TDRS Z).
- Inertial attitudes are scheduled to maximize Ku and to optimize LDRI lighting. Specifically, the wing attitudes put the sun on the wing in the X-Y plane ~60° from the nose, and the nose cap attitude puts the sun on the nose pitched down 30° to avoid sun in the crew's eyes. All maneuvers are scheduled to occur during RMS/OBSS repositioning. If maneuvers are required during the survey, scanning will be paused. VERN/ALT attitude hold is acceptable for LDRI. DAP A14 is loaded per the Unberth procedure and is used throughout the surveys. The attitude maneuvers

are choreographed so to not conflict with OBSS/DAP constraints. The maneuver to nose cap is performed during a 10-minute gap between the starboard wing and nose cap surveys. This is because nose jets are inhibited and ALT/tail-only is selected almost immediately into the nose cap survey. The maneuver to port survey is scheduled 10 minutes into the procedure. This is because free drift is selected in step 3.

- LDR1 Playbacks - Any video not obtained real-time is downlinked after all surveys are complete. See Photo/TV section. IDC images obtained during the survey are downlinked via OCA.
- OMS Pod Survey (P/TV10) is a non-RMS survey. Handheld images are taken of the OMS pod tiles. See Photo/TV section for more scheduling info and constraints.
- Contingency - If all the TPS RCC WLE surveys cannot be completed on FD2, most likely they must be completed on FD3 with the rendezvous, grapple and berth of HST delayed to FD4, losing one day of HST objectives. There is a possibility that the surveys could be completed while berthed to the HST, possibly preserving at least half of an EVA. The Nose cap survey would require a different attitude than typically planned to prevent HST solar arrays from getting too cold.

HST Related Activities:

Crew:

- FSS Prep for Berthing - Must be performed after SSE C/O and on the day prior to rendezvous. The FSS Platform is pivoted to the 90 deg. berthing position, berthing latches are opened, FSS umbilicals are retracted, and the rotator is in berthing position. The crew verifies visually and with P/TV03 still imagery & video. Note, there is generally no constraint to performing OBSS unberth simultaneously with FSS Prep, except for a crowded aft flight deck. Therefore, these activities are de-conflicted.
- RNS On-Orbit Checkout - The crew activates the RNS and starts camera and GPS recording, which will be acquired by the ground for 30 seconds. When complete, the RNS is deactivated. The crew performs this procedure on MCC Go because there is potential hardware damage if activated outside operational temperatures.
- PDIP – OFF (RNS Data Dump) - The crew performs PDIP 1 Ku Band rate to OFF, in order to enable KU Channel 2 for an RNS data dump test. After the dump is complete (15 minutes) the crew reconfigures KU Band rate to Low. No Channel 2 OCA operations are possible while Channel 2 is configured for RNS,.

Ground Commanding:

- The STOCC performs several steps to prepare HST for rendezvous and berthing with the orbiter. Highlights for FD2 through FN2 include dumping of onboard Solid State Recorders (SSR), closure of the aperture door (AD), maneuvering HST to the rendezvous attitude, reconfiguration of the comm. system from High Gain Antenna (HGA) to the Low Gain Antenna (LGA) direct TDRS, reconfig of 3 gyro operations, load shedding activity, and HGA deactivation retraction (to maximize clearance for HST grapple)

EVA Preparations: Two teams of 2 EVA crew (MS1, MS3, MS4, MS5), work thru the Airlock (A/L) Prep, EMU C/O, EVA Tool Unstow & Config. They also take Aspirin 2 hours prior to 10.2 psi depress.

- Airlock Prep - The crew enters the external airlock and begins outfitting it in preparation for the EVAs. Must be performed prior to EMU C/O.

- EVA Gather & Setup - The crew retrieves the various batteries (PGT, EHIP, REBA) , chargers (EHIP, middeck battery, REBA) and cables and stows them in their appropriate “Charged” and “EVA Systems” bags, both to be secured near battery central. Prior to stowing the chargers, they are checked out by plugging them in.
- EMU C/O- All four (4) EMU’s will be checked out in the airlock, two (2) at a time. Three (3) crewmembers are required at all times (as possible) for assistance and for comm. checks. Each EVA crew member will be checking out their own EMUs. EMU’s 3 & 4 are first, followed by EMU’s 1 & 2. The EMU’s are powered up and then checks are performed with the comm. system, the regulator/fan/pump, the Secondary O2 Package (SOP) check, and battery charging. EMU C/O should not be scheduled during 10.2 PSI cabin depress due to conflict with suit pressure check.
- EMU SWAP- After one set of EMU C/O’s are completed, they are removed the Airlock Adapter Plate (AAP) in airlock and transferred to middeck. The next pair is taken from the middeck and transferred to AAP.
- REBA C/O - The Rechargeable EVA Battery Assembly (REBA) Powered hardware checkout is performed following EMU C/O. It is first performed for EMU’s 3 & 4. Then EMU’s 1 & 2.
- EVA TOOL UNSTOW CNFG- Gathering, preparation and configuration of EVA tools for EVA1

Photo/TV Operations:

- P/TV01 VIDEO SETUP- The second day of P/TV01 operations includes configuring for EVAs and wireless video system (WVS) checkouts. Needs to occur before the first EVA.
- P/TV03 FSS Ops - Video recording during FSS Prep for Berthing. Utilizes PLB cameras to record FSS movements (lock mechanism retraction/release, pivot to 90deg, umbilical cycling, etc). Additionally, still photos of each mechanism in its ready-for-berth config will be shot. Needs to be early in the day and de-conflicted with surveys, otherwise too many people operating at the aft window at the same time..
- P/TV09 ICBC3D SETUP- Utilizing the ICBC3D PGSC (STS-6, RPOP2) which will be setup on FD1, cable connections are made to PDIP 2 on L11, ICBC3D software is enabled and the image size is tested. The setup needs to be completed in preparation for HST Rendezvous on FD3
- P/TV09 ICBC AUDIO3D – Audio recorders are setup, powered up and placed in the crew cabin
- P/TV10 EXTERNAL SURVEY - (OMS POD SRVY) - Item 1. Still photos of OMS Pod tiles. Earth shine or sun shine acceptable, day pass only. Prefer no RMS activity, since it may obstruct view.
- L10 VTR SWAP 3 Hr Tape – Due to the length of the inspections, VTR Tape swap is scheduled at the end of the Nose Cap Survey.
- LDRI DNLK – To account for any gaps in KU coverage during the surveys, about one hour of LDRI playback is scheduled after completion of surveys and OBSS Berth. INCO provides LOS times in order to help the crew cue the tapes. May have to schedule an inertial attitude to optimize comm. Note that TDRS E or W must be used as TDRS Z does not have the capability for DTV and cannot be used to downlink critical damage video.

PGSC & OCA Activities:

- PGSCs will be rebooted daily except for STS6 (RPOP2) and STS7 (WLES) as noted in the EZ blocks
- WLES RNDZ Tools C/O Prep – The backup WLES PGSC (STS6) is also the RPOP2 PGSC. Prior to RNDZ Tools C/O, WLES program is deactivated until rendezvous
- RNDZ Tools C/O- The PGSC network is reconfigured from the RNDZ configuration by MS1 and MS5 prior to Pre Sleep in prep for HST Rendezvous and berthing FD3. The Hand Held Laser (HHL) and PGSC network (RPOP and RPOP2) are checked out prior to use. Note, there is no TCS unit on STS-125 since TCS uses reflectors and the HST ones either do not work or were never tested.
- OCA – PL MAX - In Presleep, the OCA downlink rate is configured to PL Max, in order to downlink all the inspection imagery as quickly as possible (48mbps). This cannot be performed until LDRI downlink is complete. MUX/VTR/CC Power must be turned off at the L10 panel.

Secondary Payloads/SDBIs:

- ICBC3D – PGSC, camera, and audio are setup. See Photo/TV section.
- NLP ACTIVATION - GAP 1-14 Activation within L+ 48 hr; to be terminated 48 +/- 2 hrs later (FD4). Duration 20 minutes.
- SDBI 1634 LOGS - Scheduled daily on CDR, PLT, MS2, MS4, MS5 on a best effort.

Flight Day 3 - HST Rendezvous/Grapple/Berth, EVA prep

Overview: The day begins with an Orbiter simp dump. Rendezvous operations culminate in an R-bar approach, HST grapple, berth and latch. External power is activated and HST batteries are charged, while a P/TV and RMS survey of HST commences. Preparations continue for EVA 1.

OMS/RCS Burns: Major burns include NH, NC4 and Ti. NH is huge!

Attitudes/Maneuvers:

- Bias –YLV, -ZVV (Simo Dump)
 - The future loaded the night before to kick off prior to or at crew wake up in order to allow sufficient dump time prior to NH.
 - The attitude is selected as an improved MMOD protect attitude.
- Rendezvous burn attitudes
 - After the dump is complete, orbiter is maneuvered to the NH burn attitude and the rendezvous sequence commences.
- -XSI HST Battery Charging
 - After the HST is grappled and berthed, the stack is maneuvered to a bias tail sun (-XSI_ attitude for 60 minutes of HST battery charging during daylight pass. All the daylight time does not have to occur on the same orbit. See Generic Timeline Items & Constraints (Attitudes and Maneuvers Overview).

Rendezvous with HST:

- The STOCC maneuvers HST to a rendezvous attitude designed to maintain HST power and minimize plume loading on the solar arrays (SA's) at the 1500 foot normal Z braking gate. This attitude is determined by the conditions as follows: Sun in the V1-V3 plane and +V1 pointing down the R-bar at an orbit angle of 59 deg before orbital noon.

- The STOCOC slews the solar arrays to 90 degrees, to provide clearance with RMS
- The orbiter approaches HST using an R-bar approach to minimize prop usage and potential contamination.
- Before the orbiter is within 200 feet of HST, HST performs a roll maneuver to the capture attitude to align the +V2 grapple fixture on HST with the RMS. The roll mnvr will place the -V3 52 degrees out of plane north as measured on the anti-Sun side of HST. The magnitude of the roll mnvr is $\sim V1 = \text{Beta} - 52$ degrees, resulting in a roll that ranges from 0 deg to -104 degrees.
- **Orbiter then performs an inertial approach.**

HST Approach & RMS Capture/Berth Operations: The RMS is used for grappling and berthing the HST in the orbiter payload bay. Grapple is timed for sunset + 5 minutes. RMS HST maneuvering is done with Orbiter in freedrift.

Approach and Capture

- At RNDZ C/L PET of 00:05, the crew maneuver the RMS to POISE FOR CAPTURE position per PDRS C/L.
- At PET of 00:44, P/TV04 HST Retrieve/Berth setup is verified.
- The RBAR is established at PET 01:20 at which point the crew transitions to the HST RBAR APPROACH Cue Card.
- At 300 feet, the crew reports solar array position to MCC.
- At 200 feet, crew verifies that HST is in the capture attitude.
- At 100 feet KU is configured for comm.
- When HST V1 axis in alignment with Orbiter -Z axis, DAP A/INRTL/VERN.
- HST Capture - When HST grapple fixture is in the EE camera field of view, the crew performs the HST Capture, step 2 procedure from the PDRS C/L. Orbiter is moded to free drift. RMS EE maneuvered to the +V2 grapple fixture envelope and HST is captured. Orbiter DAP changes to A15, B12; No LO Z. Within 30 seconds, HST is taken to free drift .

HST Berth

- The crew simultaneously performs the HST Berth (PDRS C/L) and Latch and Mate (L & M) HST (PL Ops C/L) procedures which interlink with each other.
- The RMS/HST is maneuvered to FSS Hover while orbiter in freedrift.
- After HST Berth Step 2, FSS CCTV Setup, the crew performs Step 1 of L & M (PL Ops) to ensure the payload retention latches are powered on and ready.
- Returning to HST Berth (PDRS C/L), Step 4, the RMS/HST is maneuvered to the FSS Berth position, while Orbiter in freedrift.
- Once in position, Step 5 refers back to L & M Step 2, where partial closure of berth latch 2 is performed once the HST is verified to be in the latch position. P/TV04 of the latching begins via FSS CCTV to monitor alignment.
- When partial latch 2 is complete, the L & M crew proceeds with L & M Step 3 ,partial closure of berth latch 1.
- Next, RMS brakes come off in Step 6 (PDRS C/L), and L & M Steps 4 – 6 completely latches HST to the FSS, beginning with latch 3, followed by latch 2 and then latch 1.
- RMS ungrapples HST; meanwhile, the main umbilical is mated. The payload retention latches are powered off.

Free Drift periods:

- HST Capture (RNDZ C/L & PDRS C/L)

- HST BERTH (PDRS C/L), LATCH AND MATE HST (PL Ops C/L)
 - During RMS maneuvering and FSS berthing latch operation)
- SA SLEW to 0 (while berthed)

DAP Notes:

Orbiter & Crew Systems

- Crew Systems:
 - TEPC Status Check (EZ Activity)
 - OCAC Filter Inspection (EZ Activity)
- MCIU Filter Screen Check
- OMS HTR Reconfig- Scheduled prior to Group B powerup before Rendezvous commences the day after the B Pod Heater Reconfig. Turns off the B pod heaters that were turned on, on FD2 and turns on the A pod heaters, returning the system to its nominal config.
- GROUP B Powerup – Prior to Rendezvous, Sets up Triple G2
- GROUP B Powerdown – After completion of Rendezvous
- IMU Star of Opportunity Align
- 10.2 MAINT – 3 times during the day. See Generic Notes, EECOM.
- PDIP – OFF - Presleep, to allow HST RNS data dumps overnight
 - Must be scheduled after HDTV playbacks are complete

RMS Ops FD3 Overview:

The RMS is used to for HST capture & berth and survey (-V3 orientation)

EVA Preparation Activities: Middeck Prep, continuation of EVA 1 Tool config, and the EVA procedure Review

HST Activities – Post Berth

- HST Configuration at Berth
 - Orientation: -V3 Forward
 - Solar Array Position: 90 deg
- External Power Activation (Crew & STOCC) – After umbilicals connected at the end of the Berth (Latch & Mate procedure), FSS Power Control Units (PCU's) , external main power and external essential power are applied
- Photo/TV05 Survey (-V3) via RMS and P/TV
- Battery Charging – one full daylight pass
- Solar Array Slew to 0 degrees in preparation for EVA 1 on FD4.
 - SA's are slewed after completion of battery charging and maneuver to overnight attitude (-ZLV -XVV).
- Payload Interrogator (PI) Config, Step 5
- HST Configuration at end of day:
 - Orientation: -V3 Forward
 - Solar Array Position: 0 deg

Photo/TV:

- P/TV 03 FSS OPS - Item 3, SA Slew. Scheduled only for first SA Slew only to verify operation. Do not schedule overlap with P/TV05.
- P/TV 04 HST RETRIEVE/BERTH

- Item 1: RNDZ (Approach and Grapple)
- Item 2-5: Post-Grapple maneuver, berth, latching, HST/FSS umbilical mate. RMS release through Berth
 - Can interrupt for ICBC Scenes
- P/TV 05 HST Survey, Item 1-3
 - Requires daylight
 - Item 1: -V3 Survey
 - Item 2: HST -V3, SA at 0 degrees
 - Item 3: HST -V3, SA at battery charging position
- P/TV 09 ICBC 3D FILMING OPS- Scene 1, HST Berth
- D2X EVA CAMERA- Setup has to happen sometime before EVA 1. It is the initial setup of the D2X EVA Cameras (10 minutes per camera). Only PLT and MS3 are trained on the D2X.
- HDTV Playback Ops – Playback of HST Grapple and IMAX handheld

PGSC & OCA:

- PGSCs will be rebooted daily except for STS6 (RPOP2) and STS7 (WLES) as noted in the EZ blocks.
- POST RNDZ PGSC CONFIG- At HST grapple, PGSCs are reconfigured
- WLES RNDZ/DEPLOY RECOVERY – WLES is restored on the backup PGSC (STS-6 RPOP2)
- OCA PL MAX ops:
 - In Post Sleep, the OCA downlink rate is reconfigured Channel 2.
 - In Presleep, OCA configured for PL Max. HDTV Playback must be complete first.

Secondary Payloads/SDBIs:

- SDBI 1634 LOGS - Scheduled daily on CDR, PLT, MS2, MS4, MS5 on best effort
- ICBC3D
 - For Scenes, see Photo/TV Section
 - ICBC Status Report

Flight Day 4 – EVA 1: WFC3, SI C&DH, SCM & Locks

Overview: 6.5 hr EVA1 is performed utilizing RMS support. Tasks include replacing WFPC2 with WFC3, R&R the failed SI C&DH module, and installation of the SCM. Preparations for EVA2 begin after EVA1 is completed. If Focused Inspection will be required on FD5, EVA 1 is extended 20 minutes to remove the MFR from the RMS. OBSS would then be unberthed.

Attitudes/Maneuvers:

- -ZLV -XVV, except during the Sun protect attitudes for the EVA WFC task
 - See Generic Timeline Items & Constraints for Sun protect Details
- Future Mnvr Load for FD5 Simo Dump

Free Drift periods:

- G2 SET EXPANSION/CONTRACTION
- MFR SETUP

- SINGLE (DUAL) SA SLEW

DAP Notes:

Orbiter & Crew Systems :

- 10.2 Maintenance - Pre-EVA, just after 10.2 Repress, and just before Sleep
 - Do not perform during EMU purge
- G2 Set Expansion – Dual G2 for critical sun protect maneuvers
- G2 Set Contraction - Return to Single G2 after the EVA
- IMU Star of Opportunity Align
- Water Dumps: FES

HST Activities:

- HST Configuration at start of day:
 - Orientation: -V3 Forward
 - Solar Array Position: 0 deg
- Pivot (FSS) to 85 degrees: To allow installation of Berthing and Positioning System (BAPS) Post (P/TV03 Ops required)
- Pivot (FSS) 90 degrees: Return to nominal config (P/TV03 Ops required)
- Key HST Command Activities:
 - SI C&DH A/T, F/T & Dump
 - WFC A/T F/T & Dump
- HST Configuration at end of day:
 - Orientation: -V3 Forward
 - Solar Array Position: 0 deg

EVA Daily Choreography Summary:

Since there are two pairs of EV teams supporting a mission of five back-back EVAs, the various battery charge and EMU LiOH changeout operations are happening daily. As soon as one EV team completes an EVA, these activities begin such that they will be ready in time for their next EVA.

EVA Prep Activities:

- Participants - Each day, all EV & IV crew are scheduled in pre-EVA activities through airlock depress. Just one IV crew supports Post Depress. For each EVA, PLT (Suit IV) will run the EVA C/L for EVA Prep.
- Aspirin Protocol (2 crew) – For today's EV crew
- EVA Prep - Prep for Donning (LCVG & Biomed donning, suit data and comm ck), EMU Donning & EMU Check.
- EMU Purge - EMUs are purged with pure O2. 8 minutes.
- EMU Prebreathe - EVA crew perform a 40-minute in-suit EMU Prebreathe. Near the conclusion of the activity, the inner hatch is closed.
- Airlock Depress - the airlock is taken to 0 PSI and the outer hatch is opened.
 - P/TV03 required for first depress, to monitor HST solar array motion resulting the external airlock venting. If significant deflection is determined, P/TV03 may be required on all future depresses. Additionally, the Airlock depress rate be have to be slower, requiring an extra 10 minutes.
- Post Depress - the EVA crew switches the EMUs to battery power and the EVA Phase Elapsed Time (PET) clock begins. The EVA crew egresses the airlock.
- P/TV06 - supports EVA activities.

EVA 1 Tasks & Robotics

- **Participants:**
 - EV crew:
 - MS3 (EV1) - Free Floater (FF)
 - MS5 (EV2) - RMS
 - IV crew:
 - MS4 prime for WFC3 and SCM & Locks task
 - MS1 is prime for SI C& DH
 - SRMS Crew: MS2 is prime. CDR is backup.
- **Egress & Setup:** Prior to Egress, CDR/MS2 FSS is pivoted to 85 deg in preparation for BAPS post install. EV1 retrieves MFR from Orbiter port bay 10 and GCA's RMS for MFR grapple. EV1 then installs MFR into the RMS EE and gives GO to mnvr RMS to A/L. EV2 ingresses MFR at the airlock. Meanwhile, EV1 translates to the FSS and installs the BAPS Post, which will be primarily used to provide HST rigidizing support during the EVAs. CDR then pivots the FSS back to 90 deg.
- **WFC3:** EV1 & EV2 perform WFPC2 (the old instrument) removal. EV1 monitors WFPC2/HST clearances, while EV2 (on the RMS) removes it and stows in a temp stow position. The EV crew then retrieves the WFC-3 from the WFC Scientific Instrument Protective Enclosure (WSIPE) on the SLIC and return to HST (-V2 doors) to install WFC-3 (performed by EV2). IV gives a go for the aliveness test. EV2 then retrieves WFPC2 from the temp stow location and is maneuvered to the WSIPE to stow, while EV1 holds the WSIPE lid open.
- **SI C&DH:** EV1 translates to the MULE and retrieves the new SI C& DH (SI C&DH-R) . Meanwhile, EV2 is maneuvered to Bay 10 to remove the old SI C&DH. EV1 and EV2 swap their SI C&DH's at the MULE location. EV1 stows the old box in the MULE, while EV2 (RMS) returns to HST Bay 10 to install the new SI C& DH. IV gives go for the aliveness test.
- **SCM & LOCKS:** EV1 (FF) performs the SCM install by translating to the SCM interface on the -V2 side of the FSS. He installs a battery for SCM indicator lights, drives bolts, and then verifies that the SCM has released from the FSS and is engaged to HST. At the same time SCM install is going on, EV2 rides over to Bay 2 and does a Bay 2 Door bolt release. Next both, crew head over to the MULE to retrieve the three (3) -V2 Door locks. Then they head over to the -V2 aft shroud door and install the locks (EV2, with EV1 assisting where possible). The preferred order of installation is top to bottom. If time permits, EV1 will perform a lube application on the -V3, +V2 and FGS-2 (+V3) bay doors.
- **Closeout & Ingress** - EV crew performs a payload bay cleanup, including EV1's main umbilical mechanism inspection at the FSS and removal of the two BAPS post center rigidizing pip pins, in the event HST needs to be deployed overnight and the FSS rotated to allow PLBD closure. The crew head to the airlock, where EV2 egresses the MFR. They enter the airlock, install the SCU to the Display And Control Module (DCM). EV1 closes the outer hatch.

Post EVA Activities:

- PreRepress: Power is switched from batteries to the Service and Cooling Umbilical (SCU) which ends the PET clock.
- Repress: The airlock is repressed to 10.2 psi.

- Post EVA: Open the inner hatch, doff suits, perform EMU water recharge, suit drying/seal wipe, O2 recharge water fill verification, EMU powerdown and overnight stow.

EVA Activities (Prep for Tomorrow):

- EMU Swap- The suits just used are moved to the middeck and those being used for tomorrow's EVA are moved to the airlock.
- EVA Procedure Review- As a minimum, schedule on EV and IV crewmen. Include all crew if possible.
- EVA Tool Config- configure tools for next day's EVA
- D2X EVA Camera – See P/TV

EVA Activities (Prep for Day after Tomorrow):

- HL/PGT Batt Init – Must be after Post EVA. Requires approx 16 hrs of charging.
- BATT INIT (Middeck EMU Battery Recharge Init)- Scheduled at least 4 hours after the start of Repress to allow the batteries to cool. Also allows earlier EMU removal (EMU Swap) from the airlock by not requiring the in-suit EMU battery recharge, which could otherwise delay removal until recharge is complete. Perform the Following: Unstow/Setup MDDK Batt Charger, Remove EMU batteries from EMU and connect to charger.
- REBA Init - Must occur after EMU SWAP, term ~16 hrs later

Photo/TV:

- P/TV 03 FSS OPS (Item 4) – Airlock Depress; video only
 - P/TV03 required only for first depress to monitor HST solar array motion resulting the external airlock venting. If significant deflection is determined, P/TV03 may be required on all future depresses.
 - PLB Camera D on the +V2 solar array
- P/TV 03 Ops (Item 2) - FSS Pivot to 85 deg and back to 90 deg; video only
- P/TV 06 HST EVA - Nominal EVA P/TV ops (Items 1-6)
 - Item 1 – EVA Prep, Activities, Closeout
 - Item 2 – LGA Cover Install
 - Item 3 – BSP Install
 - Item 4 – WFC3
 - Item 5 – SI C&DH
 - Item 6 – SCM & Lock
- P/TV 09 ICBC – Filming Ops
 - Scenes 2, 3, 4 during EVA1
- D2X EVA CAMERA- Between EVAs activity takes out the card and battery and then sets up the camera for the next EVA. 5 minutes per camera. Only PLT and MS3 are trained on the D2X.
- HDTV - Crew will set up (Cue Card- Activation) for Crew Choice downlink to occur during a 2 hr window in Presleep.

PGSC & OCA:

- PGSCs will be rebooted daily except for STS6 (RPOP2) and STS7 (WLES) as noted in the EZ blocks.
- OCA Reconfig to Ch. 2 in PostSleep

- OCA Config to PL Max in Presleep, after HDTV Crew Choice is complete

Secondary Payloads/SDBIs:

- SDBI 1634 LOGS - Scheduled daily on CDR, PLT, MS2, MS4, MS5 on a best effort
- ICBC3D
 - For Scenes, see Photo/TV Section
 - ICBC Status Report
- NLP (all GAPS) is terminated 48 +/- 2 hours after activation.

Contingency Ops: If Focused Inspection required on FD5, perform the following:

- MFR Remove (via EVA & RMS) at the end of EVA1
- OBSS Unberth
- FI DOUG review (CDR,MS2)

Flight Day 5 – EVA 2: RSU, Bay 2 Battery

Overview: 6:25 EVA2 is performed utilizing RMS support. Tasks include replacing the RSU's and R&R of the Bay 2 Battery Module. Preparations for EVA3 begin after EVA2 is completed. The Orbiter maneuvers (after solar arrays are slewed) to a battery charging attitude and then to an attitude for an RSU functional test (FT). If Focused Inspection is required, it will occur concurrently with EVA Prep. An additional 20 min. required for the EVA to allow time to re-install the MFR.

Attitudes/Maneuvers:

- -ZLV, YVV for the Post Sleep Simo Dump
- Sunrise/Sunset Protect maneuvers while Aft Shroud Doors (ASD) are open during the RSU R&R task
 - See Generic Timeline Items & Constraints for Sun protect Details
- -ZLV, -XVV from end of RSU R&R to completion of EVA and SA Slew to 90 deg.
- Biased -XSI for Battery Charging, after SA Slew to 90 deg
 - See Generic Timeline Items & Constraints for battery charging att. info
- RSU Maneuver, Bias –ZLV, -XVV for the Functional test. Highly desired to be completed prior to SA Slew back to 0. SA's should not be a 0 deg, while in the batt charge attitude. Flight Rule 19-67 offers some alternate options if necessary.

Free Drift periods:

- G2 SET EXPANSION/CONTRACTION
- SINGLE (DUAL) SA SLEW

DAP Notes:

Orbiter & Crew Systems :

- 10.2 Maintenance - Pre-EVA, just after 10.2 Repress, and just before Sleep
 - Do not perform during EMU purge
- G2 Set Expansion – Dual G2 for critical sun protect maneuvers
- G2 Set Contraction - Return to Single G2 after the EVA
- IMU Star of Opportunity Align
- SSV- Power OFF
- Water Dumps:

- FES
- SIMO Dump - must be completed at least 2 hours prior to opening of aft shroud door at the start of the RSU R&R EVA task
- MCIU Filter Check

HST Activities:

- HST Configuration at start of day:
 - Orientation: -V3 Forward
 - Solar Array Position: 0 deg
- Solar Array slew to 90 for battery charging
 - Battery charging requires one full daylight pass, continuous not req'd
- Solar Array slew back to 0 after battery charging
- Key HST Command Activities (other than SA slews as listed above):
 - Bay 2 Battery A/T & F/T
 - RSU A/T & F/T
 - F/T requires a biased -ZLV, -XVV attitude
- HST Configuration at end of day:
 - Orientation: -V3 Forward
 - Solar Array Position: 0 de

RMS Ops: RMS supports EVA ops through MFR egress. At extended park overnight.

EVA Daily Choreography Summary:

Since there are two pairs of EV teams supporting a mission of five back-back EVAs, the various battery charge and EMU LiOH changeout operations are happening around the clock. As soon as one EV team completes an EVA, these activities begin such that they will be ready in time for their next EVA.

EVA Systems – Morning Activities:

These activities are not for the current day's EVA, but for tomorrows.

- EMU Battery Check - Check to see if battery charging, which was initiated the previous night, is still in operation. EMU batteries require 18 hr - 24 charge. If charging light is off, that means the charge has to be re-initiated ASAP in order to be ready (and installed in the EMUs) at the start of the next day's EVA. If batteries are not checked until the termination time in the evening, they won't be available for the next day's EVA. Note, there is one spare EMU battery being flown.
- HL/PGT Term – After ~ 16 hours after initiation.
- REBA Term - After ~ 16 hours after initiation

EVA Prep Activities:

- Participants - Each day, all EV & IV crew are scheduled in pre-EVA activities through airlock depress. Just one IV crew supports Post Depress. For each EVA, PLT will run the EVA C/L for EVA Prep.
- Aspirin Protocol (4 crew) - For today's EV crew and yesterday's EV crew.
- EVA Prep - Prep for Donning (LCVG & Biomed donning, suit data and comm ck), EMU Donning & EMU Check.
- EMU Purge - EMUs are purged with pure O2. 8 minutes.
- EMU Prebreathe - The EVA crew perform a 40-minute in-suit EMU Prebreathe. Near the conclusion of the activity, the inner hatch is closed.
- Airlock Depress - the airlock is taken to 0 PSI and the outer hatch is opened.

- Post Depress - the EVA crew switches the EMUs to battery power and the EVA Phase Elapsed Time (PET) clock begins. The EVA crew egresses the airlock.
- P/TV06 - supports EVA 1 activities.

EVA 2 Tasks & Robotics

- **Participants:**
 - EV crew:
 - MS4 (EV3) - Free Floater (FF)
 - MS1 (EV4) - RMS
 - IV crew:
 - MS3 prime for RSU
 - MS5 is prime for Bay 2 Battery
 - SRMS Crew: MS2 is prime, CDR is backup.
- **Egress & Setup:** Both crew perform MFR setup, which EV4 then ingresses at the airlock. EV3 installs the two BAPS post center pip pins, that were removed at the end of yesterday's EVA.
- **RSU R&R:** The RSU changeout procedure is the same for each RSU. IV rotates the BAPS to the RSU changeout position. The Fixed Head Star Tracker (FHST) shutters are verified closed from the standard switch panel and the RSU is deactivated. The ground handles most of the RSU commands. EV3 is going to use a PFR, so he retrieves it from the Axial Scientific Instrument Protection Enclosure (ASIPE). EV3 and EV4 head over to the SMALL ORU Protective Enclosure (SOPE) on the ORUC where the RSU's are stowed, retrieve RSU-2, and transport it (in a thermally protective bag) to the -V3 aft shroud. While EV4 is holding the door handles, the RMS backs away to open the doors. They then begin performing the RSU-2 R&R. EV3 disconnects RSU power connectors, while EV4 disengages three captive bolts. EV3 removes the old RSU-2 and hands it off to EV4 who temp stows it on the top of MFR handle. EV4 then seats the new RSU (RSU-2R) and engages the bolts, while EV3 mates the connectors. HST performs an aliveness test. The EV crew return to the SOPE to stow the old RSU-2 and retrieve the new RSU-3. The R&R procedure is then repeated for RSU-3 and then RSU-1. After all three RSU's are replaced, the -V3 doors are closed. Sun protect attitudes are no longer required at this point. EV3 returns his PFR to the ASIPE.
- **Bay 2 Battery R&R:** EV3 retrieves the new Bay 2 Battery from the SLIC. On MCC-Go, EV4, at the Bay 2 location, removes the old battery. The two EV crew swap batteries. EV4 installs the new battery, while EV3 translates over to the SLIC to stow the old battery on the SLIC for return. The ground will perform an aliveness test followed by a functional test.
- **Closeout & Ingress** - EV crew then performs a payload bay cleanup, including EV3's main umbilical mechanism inspection at the FSS and removal of the two BAPS post center pip pins, in the event HST needs to be deployed overnight and the FSS rotated to allow PLBD closure. The crew head to the airlock, where EV4 egresses the MFR. They enter the airlock, install the SCU to the Display And Control Module (DCM). EV3 closes the outer hatch.

Post EVA Activities:

- PreRepress: Power is switched from batteries to the Service and Cooling Umbilical (SCU) which ends the PET clock.
- Repress: The airlock is repressed to 10.2 psi.

- Post EVA: Open the inner hatch, doff suits, perform EMU water recharge, suit drying/seal wipe, O2 recharge water fill verification, EMU powerdown and overnight stow.

EVA Activities (Prep for Tomorrow):

- EMU Swap- The suits just used are moved to the middeck and those being used for tomorrow's EVA are moved to the airlock.
- EMU Batt- Term- After about 20 hours of charging. Needs to occur before the LIOH & Batt install activity
- LIOH & Batt Install- Has to occur after EMU Batt Term and Post EVA but before EMU Swap. LIOH cartridges are in close proximity to the EMU batteries and are changed out. Newly charged batteries are installed in the EMU's.
- EVA Procedure Review- As a minimum, schedule on EV and IV crewmen. Include all crew if possible.
- EVA Tool Config - configure tools for next day's EVA
- D2X EVA Camera – See P/TV

EVA Activities (Prep for Day after Tomorrow):

- HL/PGT Batt Init – Must be after Post EVA. Requires approx 16 hrs of charging.
- BATT INIT (Middeck EMU Battery Recharge Init)- Scheduled at least 4 hours after the start of Repress to allow the batteries to cool. Also allows earlier EMU removal (EMU Swap) from the airlock by not requiring the in-suit EMU battery recharge, which could otherwise delay removal until recharge is complete. Perform the Following: Unstow/Setup MDDK Batt Charger, Remove EMU batteries from EMU and connect to charger.
- REBA Init - Must occur after EMU SWAP, term ~16 hrs later

Photo/TV:

- P/TV 06 HST EVA - Nominal EVA P/TV ops
 - Item 1 EVA Prep, Activities, Closeout
 - Item 7 RSU
 - Item 8 Bay 2 Batt
- P/TV 09 ICBC – Filming Ops
 - Scenes 5 - 8 during EVA2
- D2X EVA CAMERA- Between EVAs activity takes out the card and battery and then sets up the camera for the next EVA. 5 minutes per camera. Only PLT and MS3 are trained on the D2X.
- HDTV - Crew will set up (Cue Card- Activation) for Crew Choice downlink to occur during a 2 hr window in Presleep.

PGSC & OCA:

- PGSCs will be rebooted daily except for STS6 (RPOP2) and STS7 (WLES) as noted in the EZ blocks.
- OCA Reconfig to Ch. 2 in PostSleep
- OCA Config to PL Max in Presleep, after HDTV Crew Choice is complete

Secondary Payloads/SDBIs:

- SDBI 1634 LOGS - Scheduled daily on CDR, PLT, MS2, MS4, MS5 on a best effort

- ICBC3D
 - For Scenes, see Photo/TV Section
 - ICBC Status Report
- NLP (all GAPS) is terminated 48 +/- 2 hours after activation.

Contingency Ops: If Focused Inspection required on FD5, perform the following:

- Focused Inspection (CDR, MS2)
- MFR Install (via EVA & RMS) at the start of EVA2
- OBSS Berth

Flight Day 6 – EVA 3: COS, ACS Part 1

Overview: 6:30 EVA3 is performed utilizing RMS support. Tasks include replacing COSTAR with COS and ACS Part 1. Preparations for EVA4 begin after EVA3 is completed. If time permits, ACS part 2 will be performed and result in the completion of the ACS repair.

Attitudes/Maneuvers:

- -ZLV –XVV, except for the Sun protect attitudes during the COS and ACS tasks
 - See Generic Timeline Items & Constraints for Sun protect Details

Free Drift periods:

- G2 SET EXPANSION/CONTRACTION

DAP Notes:

Orbiter & Crew Systems :

- 10.2 Maintenance - Pre-EVA, just after 10.2 Repress, and just before Sleep
 - Do not perform during EMU purge
- G2 Set Expansion – Dual G2 for critical sun protect maneuvers
- G2 Set Contraction - Return to Single 2
- IMU Star of Opportunity Align
- WCS Filter Check
- Filter Clean - Inspect
- Water Dumps: FES

HST Activities:

- HST Configuration at start of day:
 - Orientation: -V3 Forward
 - Solar Array Position: 0 deg
- FSS Rotation to -V2 FWD just prior to the EVA for COS & ACS
- FSS Rotation to –V3 FWD after P/TV05 –V2 survey complete
- Key HST Command Activities:
 - COS A/T & F/T and F/T Dump
- HST Configuration at end of day:
 - Orientation: -V3 Forward
 - Solar Array Position: 0 deg

RMS Ops: RMS supports EVA ops through MFR egress. At extended park overnight.

EVA Daily Choreography Summary: See FD5

EVA Systems – Morning Activities: See FD5

EVA Prep Activities: See FD5

EVA 3 Tasks & Robotics

- **Participants:**
 - EV crew:
 - MS3 (EV1) - Free Floater (FF)
 - MS5 (EV2) - RMS
 - IV crew:
 - MS4 is prime for COS
 - MS1 is prime ACS
 - SRMS Crew: MS2 is prime, CDR is backup.
- **Egress & Setup:** Both crew perform MFR setup, which EV2 then ingresses the MFR at the airlock. EV1 installs the two BAPS post center pip pins, that were removed at the end of yesterday's EVA.
- **COS:** EV2 rides over to the -V2 aft shroud door to open the doors. They both perform removal of the old COSTAR instrument and EV2 takes it over to the ORUC for temp stow. They retrieve COS from the ASIPE and close the ASIPE lid. They head over to the -V2 aft shroud location, where EV2 (on the RMS) inserts COS into place. EV11 will mate the 4 connectors pins and install the harness that had been used to keep COSTAR in place. EV2 retrieves COSTAR from the temp stow location and rides to the ASIPE to stow it for return. EV1 closes the ASIPE lid and retrieves the STS PFR for use on the ACS task.
- **ACS-Part I:** Both crew perform this activity pretty much together. At the -V2 location, the crew removes fasteners from the ACS WFC CCD Electronics Box CEB and installs four guide studs into the fastener holes. They then retrieve and install the grid cutter and ground strap from the New ORU Protective Enclosure NOPE. Then they cut the grid and remove the grid and the cutter and restow in the NOPE. They retrieve and install the ACS Fastener Capture Plate on the guide studs. This allows the crew to remove 32 fasteners and the CEB cover from the ACS so they can access the electronic cards #1 and #2, which will be removed and stowed into a card stowage module. This essentially concludes ACS for today. The temp CEB-R cover is installed. The -V2 doors are closed.
- **ACS-Part II:** If time permits in this EVA, the crew will proceed with completing ACS install. Otherwise, it will not be completed unless the STIS repair was unsuccessful. In that situation, ACS will be completed on EVA5. However, if the crew is pressing on, they will now remove cards #3 and #4. Then they will retrieve the CEB replacement module and the Low Voltage Power Supply (LVPS) from the Large ORU Protective Enclosure (LOPE). The CEB module will be installed on the ACS and the new LVPS will be mounted to the ACS handhold. The Power Input Element (PIE) cable (prepared as a getahead on a previous EVA) will be mated to the LVPS. After the PIE is mated, the power output element (POE) cable to the CEB. This will conclude ACS.
- **Closeout & Ingress** - EV crew then performs a payload bay cleanup, including EV1's main umbilical mechanism inspection at the FSS and removal of the two

BAPS post center pip pins, in the event HST needs to be deployed overnight and the FSS rotated to allow PLBD closure. The crew head to the airlock, where EV2 egresses the MFR. They enter the airlock, install the SCU to the Display And Control Module (DCM). EV1 closes the outer hatch.

Post EVA Activities: See FD5

EVA Activities (Prep for Tomorrow): See FD5

EVA Activities (Prep for Day after Tomorrow): See FD5

Photo/TV:

- P/TV 03 FSS OPS- Item 2 (Rotate to -V2), pre EVA
- P/TV 03 FSS OPS- Item 2 (Rotate to -V3), post EVA
- P/TV 05 -V2 Survey- Items 7 & 9, daylight reqd (pre EVA)
- P/TV 05 -V2 Survey- Items 8 & 9, daylight reqd (post EVA)
- P/TV 06 HST EVA - Nominal EVA P/TV ops
 - Items 1 - EVA Prep, Activities, Closeout
 - Item 9 - COS
 - Item 10 - ACS
- P/TV 09 ICBC – Filming Ops
 - Scenes 9-12, and 4A during EVA3
- D2X EVA CAMERA- Between EVAs activity takes out the card and battery and then sets up the camera for the next EVA. 5 minutes per camera. Only PLT and MS3 are trained on the D2X.
- HDTV - Crew will set up (Cue Card- Activation) for Crew Choice downlink to occur during a 2 hr window in Presleep.

PGSC & OCA:

- PGSCs will be rebooted daily except for STS6 (RPOP2) and STS7 (WLES) as noted in the EZ blocks.
- OCA Reconfig to Ch. 2 in PostSleep
- OCA Config to PL Max in Presleep, after HDTV Crew Choice is complete

Secondary Payloads/SDBIs:

- SDBI 1634 LOGS - Scheduled daily on CDR, PLT, MS2, MS4, MS5 on a best effort
- ICBC3D
 - For Scenes, see Photo/TV Section
 - ICBC Status Report

Flight Day 7 – EVA 4: STIS Repair, NOBL 8

Overview: 6:30 EVA4 is performed utilizing SRMS support. Tasks include repairing STIS and installing NOBL 8. Preparations for EVA5 begin after EVA4 is completed.

Attitudes/Maneuvers:

- ZLV -XVV, except:
 - for the Sun protect attitudes during the STIS task
 - See Generic Timeline Items & Constraints for Sun protect Details

- -ZLV, +YVV for the PreSleep Simo Dump

Free Drift periods:

- G2 SET EXPANSION/CONTRACTION

DAP Notes:

Orbiter & Crew Systems :

- 10.2 Maintenance - Pre-EVA, just after 10.2 Repress, and just before Sleep
 - Do not perform during EMU purge
- G2 Set Expansion – Dual G2 for critical sun protect maneuvers
- G2 Set Contraction - Return to Single G2
- IMU Star of Opportunity Align
- WCS Compaction
- CAB T – Cabin Temp Controller Reconfig
- MCIU Filter Check
- PDIP-OFF, For RNS Dump
- Water Dumps:
 - FES
 - SIMO Dump (evening, Post EVA)

HST Activities:

- HST Configuration at start of day:
 - Orientation: -V3 Forward
 - Solar Array Position: 0 deg
- FSS Rotation to +V2 FWD just prior to the EVA for STIS
- FSS Rotation to +V3 FWD after EVA. for P/TV05 +V3 survey
- Key HST Command Activities:
 - STIS A/T & F/T and F/T Dump
- HST Configuration at end of day:
 - Orientation: +V3 Forward
 - Solar Array Position: 0 deg

RMS Ops: RMS supports EVA ops through MFR egress. At extended park overnight.

EVA Daily Choreography Summary: See FD5

EVA Systems – Morning Activities: See FD5

EVA Prep Activities: See FD5

EVA 4 Tasks & Robotics

- **Participants:**
 - EV crew:
 - MS4 (EV3) - Free Floater (FF)
 - MS1 (EV4) – RMS. Sometimes FF (for STIS)
 - IV crew:
 - MS3 prime for NOBL8
 - MS5 is prime for STIS
 - SRMS Crew: CDR is prime, MS2 is backup.

- **Egress & Setup:** Both crew perform MFR setup, which EV4 then ingresses the MFR at the airlock. EV3 translates to the ORUC to retrieve the Fastener Capture Plate (FCP). EV4 meets EV3 at the ORUC and receives the FCP and installs in onto the Multi Use Tether End Effector (MUT EE) /ballstack. EV3 installs the two BAPS post center pip pins, that were removed at the end of yesterday's EVA, and translates to the fwd/port FSS.
- **STIS Repair** - A complex task utilizing a wide variety of tools. EV4 rides over to the +V2 doors and opens them with EV3's assistance. The crew will prep the Main Electronics Board (MEB) cover for removal. EV4 retrieves the STIS tool disposal bag from the ORUC. EV3 removes the STIS handle bar so that the MEB cover and LVPS-2R can be removed. The Handrail Removal Tool (HRT) is used to contain the fasteners and debris generated from faster removal. The MEB cover extension clamp is removed. The Clamp Removal Tool (CRT) contains fasteners and debris. EV4 retrieves the a Fastener Capture Plate (FCP) and hands it off to EV3. EV3 installs the FCP onto the MEB cover to facilitate removal and capture of the 111 fasteners. The MEB cover is then removed to allow access to the failed LVPS-2 electronics card. The MEB cover and FCP will be returned. Meanwhile, EV4 retrieves a new LVPS from the SOPE and translates to the aft shroud. The failed LVPS-2 card is then removed by EV3 and handed to EV4 for stowage. EV3 receives the new LVPS card (in a soft transport enclosure) from EV4. He then installs the new LVPS-2 card into the MEB. He then retrieves the new MEB cover from the ASIPE and installs it. The +V2 doors are then closed..
- **NOBL 8 Instal** – The crew retrieves the bay 8 MLI recovery bag from the ORUC. EV3 retrieves the NOBL8 from the MULE. EV4 removes the MLI and stows for return. He then receives the NOBL8 from EV3 and installs it.
- **Closeout & Ingress** - EV crew then performs a payload bay cleanup, including EV3's main umbilical mechanism inspection at the FSS and removal of the two BAPS post center rigidizing pip pins, in the event HST needs to be deployed overnight and the FSS rotated to allow PLBD closure. The crew head to the airlock, where EV4 egresses the MFR. They enter the airlock, install the SCU to the Display And Control Module (DCM). EV3 closes the outer hatch.

Post EVA Activities: See FD5

EVA Activities (Prep for Tomorrow): See FD5

EVA Activities (Prep for Day after Tomorrow): See FD5

Photo/TV:

- P/TV 03 FSS OPS- Item 2 (Rotate to +V2), pre EVA
- P/TV 03 FSS OPS- Item 2 (Rotate to +V3), post EVA
- P/TV 05 +V2 Survey- Items 12, daylight reqd (pre EVA)
- P/TV 05 +V2 Survey- Items 10, 11, daylight reqd (post EVA)
- P/TV 06 HST EVA - Nominal EVA P/TV ops
 - Items 1 - EVA Prep, Activities, Closeout
 - Item 11 - STIS
 - Item 12 – NOBL8
- P/TV 09 ICBC – Filming Ops
 - Scene 14 during EVA4

- D2X EVA CAMERA- Between EVAs activity takes out the card and battery and then sets up the camera for the next EVA. 5 minutes per camera. Only PLT and MS3 are trained on the D2X.
- HDTV - Crew will set up (Cue Card- Activation) for Crew Choice downlink to occur during a 2 hr window in Presleep.

PGSC & OCA:

- PGSCs will be rebooted daily except for STS6 (RPOP2) and STS7 (WLES) as noted in the EZ blocks.
- OCA Reconfig to Ch. 2 in PostSleep
- OCA Config to PL Max in Presleep, after HDTV Crew Choice is complete

Secondary Payloads/SDBIs:

- SDBI 1634 LOGS - Scheduled daily on CDR, PLT, MS2, MS4, MS5 on a best effort
- ICBC3D
 - For Scenes, see Photo/TV Section
 - ICBC Status Report

Flight Day 8 – EVA 5: Battery Bay 3, FGS 2 R&R, NOBL 5

Overview: 5:45 EVA4 is performed utilizing RMS support. Tasks include R&R of Bay 3 Battery, replace FGS with FGS 2, and install NOBL8. **If time permits, NOBL 7 installation will performed.** If the STIS failed its FT on FD7, then ACS Part 2 will be performed (if not already completed on FD6), in place of the FGS 2 task. The Orbiter maneuvers (after solar arrays are slewed) to a battery charging attitude. The High Gain Antenna (HGA) is deployed in preparation for HST Release on FD9. EMU Swap is performed in case a contingency EVA is required on FD9 to release HST. If time permits, an HST Reboost will be performed.

Attitudes/Maneuvers:

- -ZLV, -XX until Sun Protect attitudes
- Sunrise/Sunset Protect maneuvers while Aft Shroud Doors (ASD) are open during the FGS-2 R&R task
 - See Generic Timeline Items & Constraints for Sun protect Details
- -ZLV, -XVV from conclusion of FGS-2 R&R to completion of the EVA, Rotation to -V3, and Solar Array Slew to 90 deg.
- Biased -XSI for Battery Charging, after SA Slew to 90 deg
 - -ZLV, -XVV. Highly desired to be completed prior to SA Slew back to 0. SA's should not be at 0 deg, while in the batt charge attitude. See Generic Timeline Items & Constraints for more info.
- Future Load Mnvr to Batt Charge attitude, which will occur prior to crew wake
 - Inertial mnvr being planned, to simplify the mnvr load for the return to -ZLV – XVV with just an Item 19.

Free Drift periods:

- G2 SET EXPANSION/CONTRACTION
- HGA DEPLOYMENT
- SINGLE (DULE) SA SLEW

DAP Notes:

Orbiter & Crew Systems :

- 10.2 Maintenance - Pre-EVA, just after 10.2 Repress, and just before Sleep
 - Do not perform during EMU purge
- G2 Set Expansion – Dual G2 for critical sun protect maneuvers
- G2 Set Contraction - Return to Single G2
- IMU Star of Opportunity Align
- MCIU Filter Check
- PDIP – OFF in Presleep, for RNS Dump capability
- Water Dumps - FES

HST Activities:

- HST Configuration at start of day:
 - Orientation: +V3 Forward
 - Solar Array Position: 0 deg
- FSS Rotation to +V2 FWD just prior to the EVA for FGS-2
- BUS - Activate HST Essential Bus Internal Power
- *High Gain Antenna (HGA) Deploy Part 1
 - Deploy of masts
 - Highly desired while EV crew not yet ingress, in case of deploy problems
- FSS Rotation to -V3 FWD after EVA, for next day deploy
- Solar Array Slew to 90 (for morning battery charging and deploy)
- *High Gain Antenna (HGA) Deploy Part 2
- Key HST Command Activities:
 - Bay 3 A/T & F/T and FGS-2 A/T
- HST Configuration at end of day:
 - Orientation: +V3 Forward
 - Solar Array Position: 0 deg

*HGA Deploy Choreography & Rationale

HGA Dply Part 1, HST FSS Rotation, Solar Array Slew, Reboost, HGA Dply Part 2. This order is based on avoiding radiating the crew cabin and the PL bay (as well as improving structural clearances with 1. the RMS (when it grapples HST for deploy) and 2. the Orbiter tail (to minimize re-contact if there wound up being a large "tip-off" at release). HGA Dply Part 2 is separated from Part 1 because of the desire for HGA's to be in the Part 1 orientation during the reboost.

Radiation protection : There are three inhibits, BUT, "the command link is unencrypted and susceptible to hostile intrusion." So they are not radiating nominally; however, doing the sequence as planned is extra protection. By Flight Rule, the HGA dishes can only point downward when HST is rotated such that the HGA's are outboard outside the sill and pointing into the wings.

HGA Deploy Sequence:

- EVA 5 occurs with HST at +V2 forward. Solar Arrays at 0.
 - HGA Masts are vertical (in their non-deployed state) aligned with HST long axis.
 - HGA's are pointed outboard
- HGA Deploy Part 1, PL Ops, steps 1-3

- Masts are rotated 90 deg down and now are straight out. HGA's now point straight into the wings.
- Next, HGA's are gimbaled up about 90 deg, so that they are again pointing straight out.
- Now, it's safe to rotate HST to the release position (-V3 forward) and not radiate the PL bay
- Rotate HST to -V3 forward, which is the release position for the next day's Deploy
- Solar array slew to 90
- Reboost (if performed)
 - HGA Dply Part 1 leaves the dishes pointed straight out. This orientation is *desired* during reboost, so that the gimbals are as far away from hard stops as possible.
- HGA Deploy Part 2, PL Ops, step 4
 - Forward HGA is gimbaled 90 deg in Y axis; now pointed off the starboard side as far away from the RMS as possible
 - Aft HGA is gimbaled 85 deg in the orbiter Z axis; now pointed almost straight up and as far away from the tail as possible
 - Part 2 is desired (not required) to occur after Reboost.
 - If Reboost not performed, the plan is to not perturb the planned sequence by combining Part 1 and 2.

RMS Ops: RMS supports EVA ops through MFR egress. At extended park overnight.

EVA Daily Choreography Summary: See FD5

This is still the same general plan, in case of a possible unscheduled EVA 6 on FD9.

EVA Systems – Morning Activities: See FD5

EVA Prep Activities: See FD5

EVA 5 Tasks & Robotics

- **Participants:**
 - EV crew:
 - MS3 (EV1) - RMS
 - MS5 (EV2) – Free Floater (FF)
 - IV crew:
 - MS4 prime for FGS
 - MS1 is prime for Bay 3 Battery and NOBL5
 - SRMS Crew: MS2 is prime, CDR is backup.
- **Egress & Setup:** Both crew perform MFR setup, which EV2 then ingresses the MFR at the airlock. EV1 installs the two BAPS post center rigidizing pip pins, that were removed at the end of yesterday's EVA.
- **Bay 3 Battery R&R:** EV2 retrieves the new Bay 3 Battery from the SLIC. On MCC-Go, EV1, at the Bay 2 location, removes the old battery. The two EV crew swap batteries. EV1 installs the new battery, while EV2 translates over to the SLIC to stow the old battery on the SLIC for return. The ground will perform an aliveness test followed by a functional test.
- **FGS-2 R&R:** The new FGS is removed from the ORUC using the EVA handhold that is permanently installed on the FGS prior to launch. This handhold will remain in place. The FGS changeout begins by MS2 deploying the aft fixture. EV1 opens the

FGS-2 Doors, which are at +V3. After MCC-Go, the crew demates FGS-2 connectors. Using a portable handhold, which EV1 installs onto FGS-2, he removes FGS-2 and temp stows on aft fixture. EV1 (RMS) and EV2 (FF) head over to the FSIPE to retrieve the new FGS-2. They head back to the +V3 FGS bay 2, where EV1 installs the new FGS-2. The crew then close the FGS-2 bay doors and translate to FSIPE to stow the old FGS-2. The ground will then perform an aliveness test.

- **NOBL 5 Install**: The crew retrieves the bay 5 MLI recovery bag from the ORUC. EV2 retrieves the NOBL5 from the MULE. EV1 removes the MLI and stows for return. He then receives the NOBL5 from EV2 and installs it.
- **Closeout & Ingress** - EV crew then performs a payload bay cleanup, including EV2's removal of the two BAPS post center pip pins, in the event HST needs to be deployed overnight and the FSS rotated to allow PLBD closure. EV1 rides to Orbiter bay 10 and release the MFR/RMS tether and holds the MFR while the RMS ungrapples it. The MFR is installed into the APC latch. Since this is the last planned EVA, the MFR is no longer needed. The crew performs a final tool inventory and translate to the airlock. They enter the airlock, install the SCU to the Display And Control Module (DCM). EV2 closes the outer hatch.

Post EVA Activities: See FD5

EVA Activities (Prep for Tomorrow): See FD5, with the following exception:

- New LiOH is not installed in the EMU (EMU BATTERY REMOVAL/INSTALL)
 - Very recent request to save some EMU LiOH for STS-127 to support their EVAs. This can be done by not opening new LiOHs for the HST Deploy EVA (Unscheduled EVA6).

EVA Activities (Prep for Day after Tomorrow): See FD5

These activities are still performed in case an EVA is needed on FD10

Photo/TV:

- **P/TV 03 FSS OPS- Item 2** (Rotate to +V2), pre EVA
- **P/TV 03 FSS OPS- Item 2** (Rotate to -V3), post EVA
- **P/TV 06 HST EVA** - Nominal EVA P/TV ops
 - Items 1 - EVA Prep, Activities, Closeout
 - Item 13 - STIS
 - Item 14 – NOBL8
 - Item 15 – ACS II
- **P/TV08 Item 1** – HGA Deploy (Part 1 & Part 2)
- **P/TV 09 ICBC** – Filming Ops
 - Scenes 15 - 18 during EVA5
- **D2X EVA CAMERA**- Between EVAs activity takes out the card and battery and then sets up the camera for the next EVA. 5 minutes per camera. Only PLT and MS3 are trained on the D2X.
- **HDTV** - Crew will set up (Cue Card- Activation) for Crew Choice downlink to occur during a 2 hr window in Presleep.
- **P/TV 07 HST Reboost**- Note: No reboost currently planned

PGSC & OCA:

- PGSCs will be rebooted daily except for STS6 (RPOP2) and STS7 (WLES) as noted in the EZ blocks.

- PMC OCA – To test OCA Netmeeting software in prep for FD10 PFC's
- OCA Reconfig to Ch. 2 in PostSleep
- OCA Config to PL Max in Presleep, after HDTV Crew Choice is complete
- WLES RNDZ Tools C/O Prep – The backup WLES PGSC (STS6) is also the RPOP2 PGSC. Prior to RNDZ Tools C/O, WLES is deactivated until rendezvous

Secondary Payloads/SDBIs:

- SDBI 1634 LOGS - Scheduled daily on CDR, PLT, MS2, MS4, MS5 on a best effort
- ICBC3D
 - For Scenes, see Photo/TV Section
 - ICBC Status Report

Flight Day 9 – HST Release, Orbit Adjust, FSS Stow, Late Inspection

Overview: HST Batteries are charged early morning, the SRMS grapples HST, HST umbilicals are disconnected, orbiter maneuvers to HST release attitude and HST is deployed. EV crew complete EVA Prep through donning LCVG's in the event a manual HST release is needed. Two burns put the orbiter in a safe relative motion separation from HST. The orbiter then performs an Orbit Adjust burn to lower one side of the orbit to ~ 160 n. mi , thereby removing itself partially from the high debris field. The orbit cannot be circularized due to insufficient prop. The FSS is stowed. OBSS is unberthed and Late Inspection (LI) commences. Due to time constraints, OBSS Berth is not planned until FD10.

Note: If a different launch date (and therefore trajectory) results in a timeline that is too tight to complete both LI and the OA burn, the OA burn may be moved to FD10 and OBSS Berth will be performed.

HST Release Prep:

- Battery charging is required early enough in the day in order to allow the opportunity for backup daylight pass. In the published timeline, the maneuver will occur prior to crew wake up via future load.
- After battery charging complete, mnvr to –ZLV, -XVV until time to mnvr to HST Release attitude
- MS2 and MS1 are trained for HST Grapple. Grapple is scheduled as early in the day as possible so if crew gets behind, they hopefully won't miss the Release time. Requires P/TV.
- MS3 does the BSA Config for Unberth then helps CDR with FSS Umbilical Demate while ground deactivates the external power for HST, and HST goes back to battery power only.
- MS2, CDR, and MS3 will work HST Unberth while MS1, MS4, and MS5 work EVA Prep getting into their LCVGs in case they have to go out EVA to manually release HST (or manually open the aperture (AP) door). PLT will be doing Photo/TV.

Sequence of Events for Release:

- RMS mnvr HST to Release position - 0:45 (CDR, MS2, MS3)
- STS mnvr to Release attitude (don't start until HST in position) - ~0:20
- HST Release Prep - 0:30 (CDR, MS2, MS3)

- Happens concurrently with ground operations: Open AP Door, Prep for RMS Release, and PSEA Config for Release
- Open AP Door (cannot perform until in Release attitude) - 0:16 (GND)
- Prep for RMS Release - 0:04 (GND)
- PSEA Config for Release - 0:04 (GND)
- HST Release: For Safe relative motion,
 - Release is Noon - 6 min to Noon + 16 min for Negative Beta.
 - This is the case for May 11, May 12 launch days
 - Release is Noon - 22 min to Noon - 2 min for Positive Beta
 - This is the case for May 13 launch
- HST is released

OMS/RCS Burns:

- Sep Burns - Following HST Release, two Separation (Sep) burns are performed using Low Z DAP mode. The burn direction varies for Beta angle:
 - Positive Beta:
 - Sep 1 Posigrade 1.0 FPS –X burn in freedrift ~ 60 sec. post release
 - Sep 2 Retrograde 2.5 FPS – X burn at minus RBAR crossing
 - Negative Beta:
 - Sep 1 Retrograde 1.0 FPS FPS –X burn in freedrift ~ 60 sec after release
 - Sep 2 Retrograde 1.0 FPS – X burn at the + RBAR crossing
- Orbit Adjust (OA) Burn: To reduce the altitude of one side of the orbit. Not enough prop to circularize. Scheduled as early as possible after HST release and sep in order to a lot sufficient time to perform Late Inspection. This burn may move to FD10, if it's determined in real time, that Late Inspection will be impacted
 - Rel Nav is disabled prior to the OA burn

Attitudes/Maneuvers: (Post OA Burn)

- Mnv to –ZLV, -XVV until beginning of Late Inspection surveys
- Starboard WLE survey (Bias +XSI), optimized for KU
- Nose Cap WLE, (Bias +XSI) optimized for KU
- Port WLE, (Bias +XSI) optimized for KU
- -ZLV, -XVV for overnight

Free Drift periods:

- HST UNBERTH
- HST RELEASE
- OBSS UNBERTH

DAP Notes:

Orbiter & Crew Systems :

- 10.2 Maintenance - in Post Sleep
- 14.7 Repress - after certain that no unscheduled EVA needed
- Group B Powerup - For HST Release ops & Sep
- Group B Powerdown – After HST Release, Sep, OA Burn
- IMU Star of Opportunity Align
- SSV – Power ON

- Water Dumps: FES
- MCIU Filter Check
- NOMINAL H2O CONFIG
 - Any FES Dumps from that point on would use PRI A vice PRI B
- PDIP – OFF in PreSleep (for RNS Dumps)
- RCS REGULATOR RECONFIG
- HTR B – Config
 - Scheduled in post HST timeframe for this flight
 - Cycling Orbiter equipment for the first time could lead to uncovering the presence of a wire-to-wire short which has the potential of leading to a thruster failed on. Therefore, in order to decrease overall risk, avoid this procedure while HST is in the presence of Orbiter.

HST Related Activities Post Deploy:

- FSS Stow:
 - Desired to decouple with OBSS unberth due to spatial constraints at the AFD.
 - Not during OMS burns, due to mechanism motion

PDRS/RMS Ops:

- The RMS unberths the OBSS to perform Late Inspection. Due to timeline constraints for the day, the OBSS is not berthed until tomorrow (FD10). Instead, it is left on the RMS in a park position for overnight.
- RMS must be in pre-cradle during OMS burns (OA Burn). Parked at hover overnight, since there isn't enough time in the timeline for OBSS Berth today.

Late Inspection:

- Only the WLE RCC and Nose cap inspections are repeated from FD2. New for STS-125 only, daylight requirements for Zones 1-4 of Panels 8 thru 11 for both Port & Stbd surveys. The intent is to take credit for ISIS Digital Camera (IDC) in order to reduce MMOD risk numbers. These particular panels are of importance to determine minimum diameter impacts. A portion of the Port Zone 1-4, Panel 8-11 scan has a poor IDC angle. Therefore, a dedicated repeat of that portion (about 30 minutes) will be performed.
- The attitude & pointing constraints are the same as for the FD2 inspections

EVA Activities:

- Aspirin Protocol (2 crew) – For today's EV crew
- EVA Systems – Morning Activities: See FD5
- EVA Prep (Partial) - MS4(EV3), MS1(EV4) perform EVA prep through LCVG suit donning, with MS5 assistance. This is in case they have to go out EVA to manually release HST (or manually open the aperture (AP) door).
- Post EVA: After HST successfully released, EV crew back out of their EVA Prep
- EVA Tool Stow - Final stow
- D2X - Disassembly and stow

Photo/TV:

- P/TV 03 FSS OPS - (FSS Stow). Video only.
- P/TV 08 HST Release – Item 2, Grapple
- P/TV 08 HST Release – FSS berthing latches and Item 2, HST Unberth

- P/TV 08 HST Release – Item 3, HST Release
- P/TV 09 ICBC 3D- Filming Ops, Scene 18, Unberth
- SSV – Power ON
- D2X EVA CAMERA- Final; disassembly. Only PLT and MS3 are trained on the D2X.

PGSC & OCA:

- PGSCs will be rebooted daily except for STS6 (RPOP2) and STS7 (WLES) as noted in the EZ blocks.
- Post Deploy PGSC Config - Reconfigure PGSC's
- WLES RNDZ/DEPLOY RECOVERY – WLES is restored on the backup PGSC (STS-6 RPOP2)
- OCA Reconfig to Ch. 2 in PostSleep
- OCA Config to PL Max in Presleep, after HDTV Crew Choice is complete

Secondary Payloads/SDBIs:

- SDBI 1634 LOGS - Scheduled daily on CDR, PLT, MS2, MS4, MS5 on a best effort
- ICBC3D
 - For Scenes, see Photo/TV Section
 - ICBC Status Report

Flight Day 10 – OBSS Berth, Off Duty, Crew Conference

Overview: A simo dump is performed followed by berthing of the OBSS. The RMS is powered down. The crew hopefully enjoys 6 hours of Off Duty. A PAO Crew Conference and Ship-to-Ship with ISS are scheduled.

Attitudes/Maneuvers:

- –ZLV – XVV, except:
 - –YLV-ZVV for the Post Sleep Simo Dump. Designed for MMOD risk reduction
 - Comm mnvr (future loaded) to obtain sufficient for PAO Crew Conference

Free Drift periods:

- OBSS Berth

DAP Notes:

Orbiter & Crew Systems:

- COMM STRING 1 C/O (A)
 - Avoid scheduling during Late Inspection, if possible
- MCIU Filter Check
- IMU Star of Opportunity Align
- PDIP – OFF for RNS Dumps
- Water Dumps: Simo (Supply/Waste)

PAO Events:

- Crew Conference using HDTV
- Ship to Ship Call with ISS

PDRS/RMS Ops:

- OBSS Berth: Hold at Step 4 until Simo Dump is complete
- RMS Powerdown

Photo/TV: CANON G1 HDTV for PAO Event

PGSC& OCA:

- PGSCs will be rebooted daily except for STS6 (RPOP2) and STS7 (WLES) as noted in the EZ blocks.
- PFC OCA- Private Family Conferences via OCA: KU is required. All 7 crew.

Secondary Payloads/SDBIs:

- SDBI 1634 LOGS - Scheduled daily on CDR, PLT, MS2, MS4, MS5 on a best effort
- ICBC3D - ICBC Status Report

Flight Day 11 - FCS C/O, Cabin Stow (EOM-1)

Overview: FCS C/O, RCS Hotfire, PILOT Ops, D/O Briefing, L-1 Comm checks, two PAO events, Post EVA Entry Prep, Ku Antenna Stow and Cabin stow.

Attitudes/Maneuvers: -ZLV, -XVV all day .

Free Drift periods:

DAP Notes:

Orbiter & Crew Systems:

- TEPC Status Check (EZ)
- W/B STEAM VENT HTR ACT- Constraint: Should occur at least 1 hour (2 hours maximum) before the start of FCS C/O. NOTE: APU start occurs 15 minutes into the FCS C/O. Rationale: The vent heater is turned on so the exhaust duct for the water spray boiler
- Filter Cleaning- Filter Cleaning should be done just prior to FCS C/O to ensure that all avionics equipment powered up for FCS C/L will receive maximum cooling.
- IMU Star of Opportunity Align
- FCS C/O- Schedule morning of day before ENTRY for CDR, PLT & MS2 during MCC ENTRY team shift. Verifies system operation prior to entry. DPS Ops transition from G2 to G8 occurs during part 1.
 - Now requires P/TV ops to look for any stray objects
- RCS HOT FIRE- After FCS C/O. Crew fires all RCS jets to verify operations for possible use on entry and to eliminate ground checkout post flight.
- PILOT OPS
- IMU Star of Opportunity Align
- L-1 Comm Check- Perform over MLA and GDS ground sites on EOM-1 to confirm STDN entry site comm. Confirms operation of UHF comm system used during entry. The FM television system is also verified when live TV is planned for entry (i.e. pilot point-of-view camera).
- COMM STRING 2 C/O - Part B, 24 hours after COMM STRING 1 C/O PART A. Returns Comm Config back to string 2. Avoid scheduling during Late Inspection, if possible

- KU STOW- Schedule the day before landing. Scheduled the day before entry to protect for an EVA to stow the antenna if it becomes stuck.
- MADS POWER-ON- Scheduled on EOM-1 to power on the system. The Modular Auxiliary Data System (MADS) measures and records data from various sensors.
- Ergometer Stow
- LiOH Swap Swap out any 6 used LiOH cans from MD52M with the unused cans from the Ext A/L Floor Bag. Wanted those unused cans out of the A/L before the crew can't get back to them anymore.
- POST EVA ENTRY PREP- Configure EVA equipment and airlock for entry.
- Entry Cooling Config – In Presleep
- Cabin Stow Activities, includes:
 - Specialist Seat installation
 - Entry Stowage, including remove loose items in airlock
- Water Dumps: FES

PAO Events: Two events for today: Media and VIP. Used HDTV CC

Photo/TV:

- FCS C/O Survey – Look for free floating debris during APU portion
- SSV DEACT –Schedule on EOM-1 prior to presleep. Deactivates the S-band Sequential Still Video (SSV)
- PAO EVENT using CANON HDTV- Two events scheduled
- P/TV 09 ICBC 3D- Deactivation, Step 1. Disable desktop downlink
- ENTRY VIDEO SETUP- Perform prior to L-1 Comm Check due to problems which occurred on STS-119. The minicam is set up to record in-cabin images prior to entering the Head Alignment Cone (HAC) and images of the PLT's HUD after entering the HAC. The PLT HUD video is down linked via the S-bd FM system.

PGSC & OCA:

- PGSCs will be rebooted daily except for STS6 (RPOP2) and STS7 (WLES) as noted in the EZ blocks.
- OCA Reconfig to Ch. 2 in PostSleep
- WLES DEACTIVATION- Schedule immediately before PGSC Stow (Part
- PGSC STOW (PART 1)- Color printer and all PGSC's stowed, except STS-2 WINDECOM. This includes ICBC3D.

Secondary Payloads/SDBIs:

- SDBI 1634 LOGS - Scheduled daily on CDR, PLT, MS2, MS4, MS5 on a best effort
- ICBC3D
 - Deactivation, See Photo/TV section
 - Daily Status Report

Flight Day 12 – Deorbit Prep, Entry

Overview: Continuation of stow and powerdowns of equipment required for entry. IAlso, systems preparation for deorbit, entry and landing.

Attitudes/Maneuvers:

- Maneuvers for IMU Align & Verif

- -XSI radiator cold soak, thermal conditioning

Free Drift periods:

DAPS Notes:

Orbiter & Crew Systems:

- MADS ENABLE- Scheduled on entry day prior to deorbit prep. The Modular Auxiliary Data System (MADS) measures and records data from various sensors.
- Group B Pwrup: Dual G2
- OCAC Filter Inspection (EZ)
- OCAC STOW
- GIRA Stow
- TEPC Status Ck (EZ)
- Fluid Loading Prep (EZ)
- CSA-CP Stow (EZ)
- CDR, PLT Seat activation
- TEPC POWERDOWN
- AIR SAMPLE

HST Systems:

- SSE DEACT - Deactivate SLIC heaters and Power off SLIC. Deactivate CCTV heaters. Deactivate ORUC Power and FSS heaters. Deactivate MULE heaters, power down MULE and FSS FMDMs. SSE deactivation must be less than 1 hr prior to PLBD closure Ref PLOPs.

Photo/TV:

- P/TV09 ICBC3D Deact- Deactivate the main power and heaters
 - Actual detailed callout: SSP2 ICBC3D – Power Off
- P/TV09 ICBC3D Audio Stow- Label CF cards, disconnect microphones, and stow all before deorbit prep

PGSC

- PGSC STOW (PART 2)- Undock PGSC from docking station. Stow remaining PGSCs

Secondary Payloads/SDBIs:

- SDBI 1634 LOGS -
 - Scheduled daily on CDR, PLT, MS2, MS4, MS5 on a best effort
 - Actiwatch activity monitors (watches) are doffed for SDBI 1634.
- ICBC3D: See Photo/TV section